

## DETAILED ACTION

### *Previous Office Action Vacated*

The previous Office Action, mailed 23 May 2008, is vacated because of missing pages.

This Office Action is responsive to Applicant's Amendment and Remarks, filed 12 Mar 2008; in which claim 7 is cancelled, claims 1, 18 and 19 are amended to change the scope and breadth of the claim, and new claims 20-25 are added.

This application is the national stage entry of PCT/EP03/01091, filed 04 Feb 2003; and claims benefit of foreign priority document FINLAND 20020675, filed 09 Apr 2002; the certified copy of this foreign priority document is in English.

Claims 1, 5, 6, 8-16, 18, 19 and 22-25 are pending in the current application.

### *Rejections Withdrawn*

Applicant's remarks, filed 12 Mar 2008, with respect to the rejection of claims 1 and 5-21 35 under U.S.C. 112, second paragraph, as being indefinite have been fully considered and found to be persuasive to remove the rejection as the terms "more than 65 weight %", "over 85 weight %" and "90 to 96% or more" are not found in the claims and the metes and bounds of the ranges as claimed would be understood by one of skill in the art.

Therefore the previously stated rejection is **withdrawn**.

Applicant's amendment, filed 12 Mar 2008, with respect to the rejection of claims 1, 5-16 and 18-19 under 35 U.S.C. 112, second paragraph, as being 35 U.S.C. 103(a) as being unpatentable over Heikkila et al. (US Patent 6,572,775, of record) in view of Masuda et al. (US Patent 5,391,299, of record) has been fully considered and found to be persuasive to remove the rejection because claim 7 is cancelled and the amendment to claim 1 changes the scope and breadth of the claim to require a cation exchange resin with a degree of crosslinking of 2 to 4.5%.

Therefore the previously stated rejection is **withdrawn**.

The following new grounds of rejection are necessitated by Applicant's Amendment, filed 12 Mar 2008; in which claim 7 is cancelled, claims 1, 18 and 19 are amended to change the scope and breadth of the claim, and new claims 20-25 are added. Claims 5, 6 and 8-16 depend from claim 1 and incorporate all limitations therein, including the amended limitations changing the scope and breadth of the claim.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of

the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 5, 6, 8-10, 13-15, 18, 19, 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Heikkila et al. (US Patent 6,572,775, of record) as evidenced by Scott et al. (US Patent 5,348,871, issued 20 Sep 1994, cited in PTO-892) in view of Catani et al. (US Patent 5,988,177, issued 07 Dec 1999, cited in PTO-892) and in view of Masuda et al. (US Patent 5,391,299, of record).

Heikkila et al. discloses a method for fractionating a solution into two or more collected fractions by a chromatographic simulated moving bed process. (Abstract). Heikkila et al. discloses Finex CS 13 GC, a polystyrene matrix crosslinked with divinylbenzene (DVB). (Column 14, lines 50-56). Heikkila et al. discloses the use of Finex columns crosslinked with 5.5% DVB to separate sucrose, a disaccharide from trisaccharides and monosaccharides. (Columns 7 to 8, Example, 1, Table 1B, and Table 1C). The trisaccharides and monosaccharides in the feed solution was present as 2.8% and 0.6% weight of dry solid weight respectively. (Column 8, Table 1B). Heikkila et al. further discloses the use of Purolite PCR 651 with 5.5% DVB for purification of sucrose, without any other saccharides. (Example 5, Columns 12-13, Tables 5A and 5B).

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Heikkila et al. discloses molasses, starch hydrolysates and wood hydrolysates as suitable feed solution. (column 5, lines 15-25). As evidenced by Scott et al., wood hydrolysate contains the disaccharide cellobiose (Scott et al. column 2, lines 20-50). Heikkila et al. discloses the separation of monosaccharides, disaccharides and trisaccharides, specifically glucose, fructose, sorbitol and sucrose (column 5, lines 26-30). Heikkila et al. discloses a separation temperature of 80°C is disclosed (Example 2).

Heikkila et al. does not expressly disclose the use of a feed solution having a saccharide dimer content of 70-90 weight % or the ranges of trimer claimed herein. Heikkila et al. does not specifically disclose a crystallization step. Heikkila et al. does not specifically disclose the method comprising eluting said feed solution on a cation exchange resin of a degree of crosslinking of 2 to 4.5%.

Masuda et al. teaches a moving bed type fractionating method for the separation of maltose, a disaccharide, from a starch with disaccharide (maltose) content of 30-50% by weight resulting in maltose purity of 80% by weight. (Abstract; Column 16, lines 60-65). Matsuda further teaches that it is general practice to purify maltose product by crystallization. (Column 1, lines 45-50).

Catani et al. teaches the separation of sugars by conventional chromatographic techniques is known to those of ordinary skill in the art (column 12, lines 8-15). Catani et al. teaches a simulated moving bed technique using an "anionic exchange resin" such as the sodium salt of a styrene-divinyl benzene sulfonic acid resin which has a degree of crosslinking from 4 to 6% (column 12, lines 17-20). An "anionic exchange

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resin" exchanges the cation counterions of the anionic resin, which is to say an exchange resin that is anionic or an "anionic exchange resin" is synonymous with a "cation exchange resin" because anionic describes the resin and cation describes what is exchanged. Catani et al. teaches "When the degree of crosslinking of the resin is above 6%, the efficiency of separation decreases. When the degree of crosslinking of the resin is below 4%, the mechanical integrity of the resin is undesirable." (column 12, lines 20-25).

It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the invention disclosed by Heikkila et al. with the use of a feed solution with more than 65% weight % of saccharide dimer or the ranges of monomer/trimer claimed herein and the teaching of Catani et al. of the use an cation exchange resin with a degree of crosslinking from 4 to 6% and the teaching of Masuda et al. of the disaccharide maltose and a crystallization step. One of ordinary skill in the art would be motivated to choose the resin with 4% and 6% crosslinking because Catani et al. teaches "When the degree of crosslinking of the resin is above 6%, the efficiency of separation decreases. When the degree of crosslinking of the resin is below 4%, the mechanical integrity of the resin is undesirable." (Catani et al. column 12, lines 20-25). One of ordinary skill in the art would have been motivated to use a cation exchange resin with crosslinking of 4% and an ion exchange resin of 6% crosslinking to separate disaccharides from a feed solution because Heikkila et al. discloses the use of multiple ion exchange resins to separate saccharide solutions. Furthermore, double purification using two different types of resins would have been within the grasp of one of ordinary

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skill in the art with a reasonable expectation of success to result in the invention as claimed. It would have been obvious to one of ordinary skill in the art to apply the known techniques of Masuda et al. to a known method ready for improvement to yield predictable results. With regard to the use of a feed solution having a saccharide dimer content of 70-90 weight % or the ranges of trimer claimed herein, it has been held that it is within the skill in the art to select optimal parameters, such as amounts of ingredients, in a composition in order to achieve a beneficial effect. See *In re Boesch*, 205 USPQ 215 (CCPA 1980). The recitation "process resulting in a separated saccharide dimer fraction by removal of at least 75% of said saccharide trimers from the feed solution," and "and a yield of saccharide dimer of over 85% weight % based on the disaccharide content of the feed solution" is considered a functional recitation of an inherent property of the method of purifying a saccharide feed solution through two types of crosslinked resins. All the claimed steps herein are known in the prior art and one skilled in the art would have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded predictable results to one of ordinary skill in the art at the time of the invention.

Thus the claimed invention as a whole is *prima facie* obvious over the combined teachings of the prior art.

**Response to Applicant's Remarks:**

Applicant's arguments, filed 12 Mar 2008, with respect to claims 1, 5, 6, 8-10, 13-15, 18, 19, 22 and 23 have been fully considered but are moot in view of the new ground(s) of rejection.

Claims 1 and 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Heikkila et al. (US Patent 6,572,775, of record) as evidenced by Scott et al. (US Patent 5,348,871, issued 20 Sep 1994, cited in PTO-892) in view of Catani et al. (US Patent 5,988,177, issued 07 Dec 1999, cited in PTO-892) and in view of Masuda et al. (US Patent 5,391,299, of record) as applied to claims 1, 5, 6, 8-10, 13-15, 18, 19, 22 and 23 above, and further in view of Liaw et al. (US Patent 6,129,788, issued 10 Oct 2000, cited in PTO-892).

Heikkila et al. as evidenced by Scott et al. and in view of Catani et al. and in view of Masuda et al. teaches as above.

Heikkila et al. in view of Catani et al. and in view of Masuda et al. does not specifically teach the saccharification involving alpha-amylase or beta amylase and pullulanase.

Liaw et al. teaches the production of saccharide preparations involving separations (abstract). Liaw et al. teaches the production of syrups by treatment of starch during a liquifaction step with a thermostable alpha amylase and saccharification using a beta-amylase and a transglucosidase (column 2, lines 58-67). Liaw et al. teaches the transglucosidase pullulanase (column 2, lines 10-15) and alpha amylases glucoamylase and isoamylase.

It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the invention taught by Heikkila et al. in view of Catani et al. and in view of Masuda et al. with the the teaching of Liaw et al. of the saccharification involving

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alpha-amylase, beta amylase and pullulanase. Both the inventions taught by Heikkila et al. in view of Catani et al. and in view of Masuda et al. and the invention of Liaw et al. are drawn to the field of sugar separations. It would have been obvious to one of ordinary skill in the art to apply the known techniques of Liaw et al. to a known method ready for improvement to yield predictable results. All the claimed steps herein are known in the prior art and one skilled in the art would have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded predictable results to one of ordinary skill in the art at the time of the invention.

Thus the claimed invention as a whole is *prima facie* obvious over the combined teachings of the prior art.

**Response to Applicant's Remarks:**

Applicant's arguments, filed 12 Mar 2008, with respect to claims 1 and 10-12 have been fully considered but are moot in view of the new ground(s) of rejection.

Claims 1, 15, 16, 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Heikkila et al. (US Patent 6,572,775, of record) as evidenced by Scott et al. (US Patent 5,348,871, issued 20 Sep 1994, cited in PTO-892) in view of Catani et al. (US Patent 5,988,177, issued 07 Dec 1999, cited in PTO-892) and in view of Masuda et al. (US Patent 5,391,299, of record) as applied to claims 1, 5, 6, 8-10, 13-15, 18, 19, 22 and 23 above, and further in view of Antrim et al. (US Patent 6,436,678, issued 20 Aug 2002, cited in PTO-892).

Heikkila et al. as evidenced by Scott et al. and in view of Catani et al. and in view of Masuda et al. teaches as above.

Heikkila et al. in view of Catani et al. and in view of Masuda et al. does not specifically teach the separation of sorbitol and maltotritol from maltitol, or the separation of glucose and maltotriose from maltose.

Antrim et al. teaches the separation of maltose products (abstract). Antrim et al. teaches "Similarly, in the preparation of maltitol, it is commercially desirable to provide maltose in a substantially pure form, so that sorbitol and higher molecular weight hydrogenated sugars such as maltotritol are not formed upon hydrogenation of the maltose. For these reasons, the production of maltose in a highly pure form is highly commercially desirable. It is particularly desirable to avoid substantial amounts of glucose, maltotriose, or other lower molecular weight sugars, because of the difficulty in separating maltose from such other carbohydrates." (column 1, lines 30-40).

It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the invention taught by Heikkila et al. in view of Catani et al. and in view of Masuda et al. with the teaching of Antrim et al. of separating maltitol from sorbitol and maltotritol or separating maltose from glucose and maltotriose. Both the invention taught by Heikkila et al. in view of Catani et al. and in view of Masuda et al. and the invention of Antrim et al. are drawn to the field of sugar separations. It would have been obvious to one of skill in the art to apply a known technique to a known method ready for improvement to yield predictable results to combine the technique taught by Heikkila et al. in view of Catani et al. and in view of Masuda et al. with the

separation of maltitol from sorbitol and maltotritol or the separation of maltose from glucose and maltotriose taught by Antrim et al.

**Response to Applicant's Remarks:**

Applicant's arguments, filed 12 Mar 2008, with respect to claims 1, 15, 16, 24 and 25 have been fully considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

No claim is found to be allowable.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan S. Lau whose telephone number is 571-270-

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3531. The examiner can normally be reached on Monday - Thursday, 9 am - 4 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shaojia Anna Jiang can be reached on 571-272-0627. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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